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Curiosity and Powerful Learning[1]

David Hopkins and Wayne Craig[2]

There is no more important goal for educators than enabling their students to develop the habit of enquiry and to embed a spirit of curiosity. Accomplishing this, as well as achieving high academic standards, is a task that seems to be beyond most jurisdictions, however well intentioned. For we are at a time in our educational history where there is a dominant culture of top down reform and external accountability. Nevertheless, ***David Hopkins*** *and* ***Wayne Craig*** *did just this through using the 'powerful learning' framework they developed in the Northern Metropolitan Region of Victoria, Australia. In this contribution to the Education Today themed issue on "Understanding Achievement", David and Wayne tell the story of how they achieved Curiosity and Powerful Learning for their students by working from the 'inside – out' and by building a systemic work culture that facilitated teacher leadership.*

A brief overview

In beginning this story of how we achieved Curiosity and Powerful Learning for our students we start by stressing the importance of developing curiosity and the challenges involved in achieving it. We use the example of their work on school reform in Melbourne as a way of outlining a replicable model of school and system development that starts from the learner and moves outwards. In describing how they delivered on both moral purpose and the student achievement goals of enhanced literacy, numeracy and curiosity we:

- provide the context for their work on generating curiosity within students in Melbourne's Northern Region;
- outline the school and system improvement model for implementing this approach;
- describe the Instructional Core and Whole School Theories of Action;
- review the Teacher 'theories of action' and the subsequent 'Curiosity Booklet' derived from the 'instructional rounds' strategy that proved critical in deepening the culture of teaching leadership in the Region; and,
- conclude with the theories of action that support such an approach to school system reform.

On the Importance of Curiosity

Does curiosity matter? You bet! – or words to that effect – is the most common response when educators are asked this question. A follow up question, "are schools killing curiosity?", is also met with near universal agreement that schools play a major role in reducing curiosity.

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We know almost intuitively that curiosity is important. It can be the driver of engagement and lifelong learning and is seen by many as the force behind innovation and economic growth over recent centuries.

There is little doubt that curiosity matters. According to some research, those who are curious at an early age score better on IQ tests at age eleven (Raine et al 2002).

Curiosity thinkers are:

- More motivated to learn
- More likely to be academically successful;
- Inclined to explore widely and deeply*;*
- Likely to be able to think creatively;
- Best suited to working collaboratively;
- Less likely to be replaced by computers.

At the same time, curious students can be a challenge for teachers. Curious students can be challenging, dislike rules and conventions, like diversions and can readily clash with authority figures (like teachers).

It also appears that curiosity diminishes over time and particularly when children start school. Before starting school, most children ask twenty-five to fifty questions an hour. As Susan Engel (2011) has demonstrated, the number of questions can fall to less than two questions per hour.

Therefore a key role for educators is to sustain and enhance curiosity. On the pages that follow we tell the story of how we did this through for example the development of our theories of action, the approaches described in *Curiouser and Curiouser* (Munro 2015) that provide highly practical approaches to help our students remain curious, and by investing heavily in teacher leadership. In the end, if we want our students to be curious, we must teach them. We begin by briefly describing the context within which we initially collaborated.

Achieving Curiosity in Melbourne's Northern Region

Melbourne is Australia's second largest city and has a population of just over 4 million. The Northern Metropolitan Region (NMR), which covers the city's northern suburbs, includes more than 200 government primary, secondary and special schools, 80,000 students and 7.500 principals and teachers. It is culturally and socioeconomically diverse and is home to some very affluent communities as well as some of Australia's poorest urban communities.

The school system has three sectors – a government system that caters for around seventy per cent of students, a Catholic system that has around twenty per cent of all enrolments and a range of independent or private schools that are often faith-based and that account for the remaining students. The government school sector – the focus here – is highly devolved with more than ninety per cent of all funding going directly to schools. Representatives of the school and the Education Department appoint principals and principals determine the staff composition of the school staff and appoint teachers.

The approach adopted in NMR in utilising the curiosity and powerful learning framework as a strategy for successful school reform at the local level is described in some detail here, in the belief that it can provide a transferable model for other settings (Hopkins, Munro and Craig 2011, Hopkins 2013, Hopkins and Craig 2015a, b & c).

Successful school systems around the world—those that have high levels of equity in student achievement and success—are characterised by moral purpose and clarity of goals that have direct implications; not just for schooling, but also for the way society develops. This is also the case in the NMR that continues to strive to become a world-class educational system. The moral purpose for school reform in the NMR is to:

> *Provide a high quality education for all students regardless of background. This is to ensure that the conditions are in place to enable every student in the region to reach their potential. This moral purpose is reflected in a small number of tangible, but ambitious objectives, for student learning and achievement that are being vigorously pursued. These goals are also in line with the reform areas [in the 'National Partnership Agreements' that were agreed] with the Federal Government. The goal is for all students in [the region] to be literate, numerate and curious, with schools continuing to provide a broad-based 21st century curriculum. (DEECD 2011, p. 8)*

Through setting such a goal and establishing the process of school reform to achieve it, the ambition is that in a relatively short space of time students, their parents, carers, teachers and other stakeholders, will notice a real difference. For example, NMR defines the following goals for 2013 (Northern Metropolitan Region 2009, p 9).

- A student finishing primary school will demonstrate individual performance at or above national standards in literacy and numeracy and a sharp curiosity for learning. Thus literate, numerate and curious became the rallying call for school improvement across the region.
- A student finishing secondary school will have a clear well-defined pathway to further training and education.
- Parents and carers will have a substantive and meaningful engagement with their child's school and teachers and a clear understanding of their child's progress against national standards.
- Teachers will have world-class professional skills, be high regard in their school communities and have continuing access to quality professional learning opportunities.
- The community will have confidence that individual student performance meets national standards and that graduates of NMR schools are capable of making valuable contributions as citizens and employees.

If these are the goals, then the approach to school improvement adopted by the Northern Metropolitan Region is the means of achieving them. The model shown in Figure 1, identifies the crucial elements of an effective school, demonstrates their interdependence and provides a guide to strategic action. This is an action framework designed to help both those working directly in schools and those working at district or regional level, to more effectively manage the realignment of top-down and bottom-up change over time. This approach not only illustrates how a region such as NMR is balancing top-down and bottom-

up change in practical ways, it also introduces a new concept, for Australia at least, of successful change by moving from the inside out rather than the outside in.

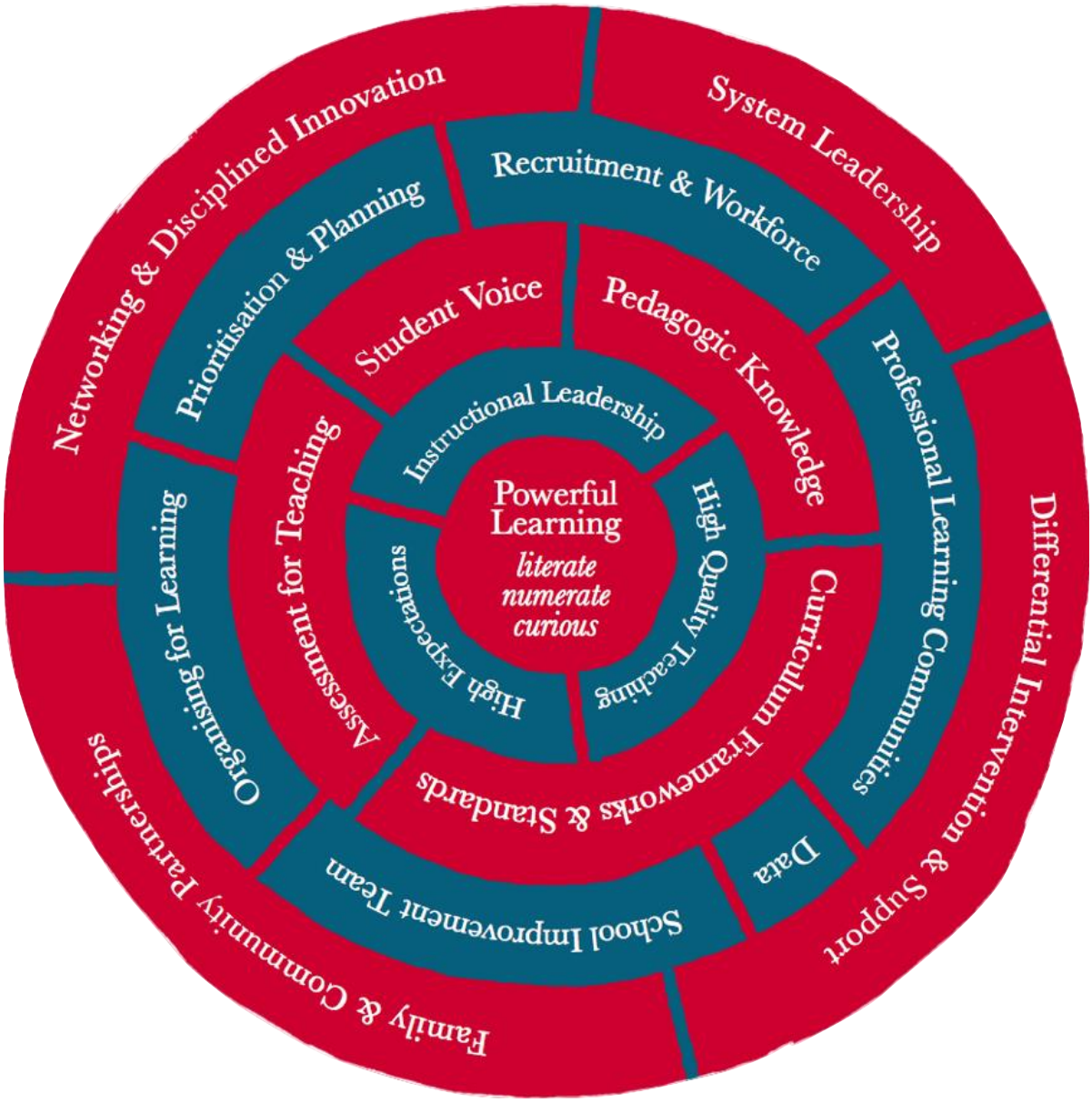

Figure 1 - The powerful learning regional school improvement strategy framework (Reproduced from Northern Metropolitan Region 2009, p. 13)

The main features of the approach are as follows.

1. In the centre is powerful learning, which represents the school's goal that every student will reach their potential, together with a definition of achievement that embraces standards of literacy, numeracy and learning capability (curiosity). Such a learning focus will not only raise standards, but also reduce the range of performance in a school, thus simultaneously 'raising the bar and narrowing the gap'.

2. Effective schools are not simply an amalgam of disparate elements. There are some essential features that need to be in place that lay the basis for greatness—these are the pre-conditions for effectiveness, upon which all else is built. Without these, a school will be unable to achieve or sustain excellence. These three features, represented in the second ring of the diagram, are:
    - The importance of instructional leadership
    - The quality of teaching
    - A culture of orderliness and high expectations.
3. The next ring is comprised of those essential ingredients of effective classroom practice necessary for powerful learning:
    - The teacher's repertoire of teaching and learning strategies, commonly known as pedagogical knowledge
    - The organisation of curriculum in terms of frameworks and standards
    - The way that learning is assessed in order to inform teaching
    - The ways in which students are involved in developing their learning skills and their place in the organisation of the school.
4. The organisational conditions supportive of high levels of teaching and learning are detailed as the key elements found in the next ring, these are:
    - Collaborative planning that focuses on student outcomes
    - Professional learning that is committed to improvement of classroom practice
    - Regular use of data, enquiry and self-evaluation to improve teaching
    - The recruitment of teaching staff and the deployment of the whole school workforce
    - The identification of a school improvement team to provide the research and development capacity for the school
    - The way in which the school is organised to most effectively promote learning.
5. The broader systemic context of the school is represented in the outer ring of the diagram by reference to four obligations and opportunities enjoyed by all schools in the Northern Metropolitan Region:
    - The opportunity to network with other schools in order to share good practice and engage in disciplined innovation
    - The way in which schools embrace and respond to the needs and opportunities provided in their locality from parents, carers and communities
    - The new opportunities for principals to engage in broader forms of 'system leadership' where they take on a range of roles in supporting other principals and schools
    - The opportunity to engage in more purposeful reflection on the effectiveness of the school's provision provided by the region's regular reviews of schools and the subsequent planning and differential intervention and support determined by the school's current performance.

Starting from the INSIDE

A further perspective needs to be added that is critical to an understanding of the NMR approach and its general applicability. Most school reform assumes that change comes from the outside–in. The logic goes something like this:

> *A high quality policy or program is developed and then implemented, with the assumption that it will impact upon the school and be internalised through the*

> *school's planning processes. In turn, it is assumed this will impact on classroom practices and will therefore positively affect the learning and achievement of students. (DEECD 2011, p. 11)*

It is as if the drive comes from the outer circle of the diagram and permeates the various layers, hopefully reaching the powerful learning of students in the centre.

However, in our experience, those schools that have made the jump from 'good to great', the linear logic of policy implementation has been inverted. Instead of doing outside–in better, or more efficiently, they start from the centre of the circle and move outwards; these schools begin at the other end of the sequence, with student learning. It is as if they ask, 'What changes in student learning and performance do we wish to see this year?' Having decided these, they then discuss what teaching strategies will be most effective at bringing them about, and reflect on what modifications are required to the organisation of the school to support these developments. Finally, they embed within their school improvement plans, those policy initiatives that provide the best fit with the school's vision, values and goals for enhancing student achievement. It is these schools that appear to be the most effective at interpreting the national, state and regional reform agenda. The underlying purpose of the powerful learning framework described above is to generate this degree of confidence and agency in schools. In so doing, it exposes the paucity of simple autonomy as a recipe for systemic educational reform. It is this framework that provides the scaffolding for 'inside-out' working.

After several years, it was clear that significant progress had been made in terms of literacy and numeracy. Taken as a whole, all of the performance measures available - National Program for Assessment – Literacy and Numeracy (NAPLAN) data, Year 12 Achievement data, Year 12 or Equivalent Completion data, student, teacher and parent opinion data – were tracking in a strongly positive direction. Literacy and numeracy data for years 3, 5, 7 and 9 showed that the region had in broad terms gone from being one of the poorest performing to one of the better performing of the state's nine regions, with all data sets either above or very close to state means. Year 12 performance data had grown significantly particularly in terms of a dramatic reduction in the number of very poorly performing schools. Growth in Year 12 Attainment by Age 19 showed the greatest increase of any of the regions in the period 2001 to 2010. Student, teacher and parent opinion data, gathered annually also showed on-going and significant growth (DEECD 2011).

Instructional Core and Whole-School Theories of Action

Although commendable, the progress on student gains in literacy and numeracy made in NMR has parallels with a number of other regions and districts (Hopkins 2013). Short-term increases on these measures are often achieved through the use of top down and instrumental strategies. The real challenge is to sustain these improvements into the medium and long term and *at the same time* enhance the learning skills, the spirit of enquiry or curiosity of our students. This is where the focus on implementation and inside-out working becomes so important. This is where our work is perhaps more unique, so we need to set the scene in a little more detail.

For us, the elephant in the room of school and system improvement, and it has been resident for sometime, is the **lack of a professional practice that provides a language and a**

set of behaviours or processes to connect teaching to learning. There are two key problems here: the first the individualised and atomised nature of teaching as a profession; the second that teaching is a profession without a practice. These two tendencies intertwine in intricate and resilient ways.

We have been helped to understand the nature of this complexity through conversations with Richard Elmore, and more recently through reading the book he co-authored with his colleagues entitled *Instructional rounds in education* (City et al. 2009). In that book they contrast the individualism that too often characterises teaching, where the person and the practice are intertwined, with professionals who are those that share a common practice and open it up to public scrutiny. Professionals believe that the only way to improve one's practice is to allow yourself to think that your practice is *not* who you are. It is, instead, a way of expressing your current understanding of your work, your knowledge about your work, and your beliefs about what is important about the work. All these things can change—*should* change if you are a professional—as your knowledge, skill, expertise and understanding of your work increases. The real insight here is that you can maintain all the values and commitments that make you a person and still give yourself permission to change your practice. Your practice is an instrument for expressing who you are as a professional; it is not who you are. How practice is defined is therefore critical and Elmore and his colleagues (City et al. 2009, p. 3) mean something quite specific:

> *We mean a set of protocols and processes for observing, analyzing, discussing and understanding instruction that can be used to improve student learning at scale. The practice works because it creates a common discipline and focus among practitioners with a common purpose and set of problems.*

It is the lack of such a practice that has inhibited recent reform efforts from unleashing the potential of our students. We need to reach down into the classroom and deepen reform efforts by moving beyond superficial curriculum change to a more profound understanding of how teacher behaviour connects to learning. In particular, it requires a direct and unrelenting focus on what many are now calling the 'instructional core'.

In its simplest terms 'the instructional core is composed of the teacher and the student in the presence of content' (City et al. 2009). Although there are a number of principles associated with the definition of the instructional core, there are three features associated with our interpretation of the concept in particular that require emphasising from the outset.

The first feature is the individual elements of the instructional core that provide the framework for developing curiosity and powerful learning within our students. These are the critical aspects of classroom practice that were identified in one of the middle rings of the school improvement strategy described in **Figure 1**. They are curriculum frameworks, pedagogic knowledge, student learning and assessment, as seen in **Figure 2**. Each of these core elements are supported by their own set of common practices and protocols, that in our case were developed both centrally and locally, but implemented and shared across all the schools in the Region. By doing this, particularly through the development of the Theories of Action, we were able to generate a common language around teaching and learning focussed on the generation of student curiosity. It is important to note, as we do

below, that these four core elements of classroom practice coalesce to create the tasks that students undertake that on completion define their performance.

Figure 2 - The core elements of classroom practice: the 'instructional core'

The second feature follows from the first and is that one element of the instructional core cannot be changed without impacting directly on the others. Yet most change efforts focus on only one—curriculum innovation, or professional development or student voice or assessment. They all need to be regarded as a whole if authentic change in student achievement is to occur. It is the relationship between the teacher, the student, content and assessment—not the qualities of any one of them by themselves—that determines the nature of instructional practice. Each corner of the instructional core has its own particular role and resources to bring to the instructional process.

The third feature is more subtle but even more important. It is an understanding that the 'instructional task' is at the centre of the instructional core. The instructional task is the actual work that students are asked to do as part of classroom practice. It is not what teachers think they have asked students to do, nor what the prescribed curriculum says they should be doing, but what students are actually doing and the sense they make of it, that is fundamental (City et al. 2009). This is why in *Models of learning: tools for leaching* (Joyce, Calhoun & Hopkins 2009, p. 7) we claimed that:

> *Learning experiences are composed of content, process and social climate. As teachers we create for and with our children opportunities to explore and build*

important areas of knowledge, develop powerful tools for learning, and live in humanizing social conditions.

Unless we make the instructional task the focus of our enquiry, then we can have no confidence that learning will be enhanced and consequently, the outcomes of educational reform will remain capricious. We must continuously remind ourselves that it is the tasks that students undertake that predict their performance (Doyle, 1983). Taken as a whole it is the instructional core with the task at the centre that provides the essential classroom infrastructure for promoting curiosity.

The potential contained in the implementation of these principles is to create a new culture of teaching and learning within the school. This requires utilising strategies that have the ability to build a common language of instructional practice within the Region. To do this we refined the generic instructional rounds leadership strategy that was being adopted across the State (Hopkins and Craig, 2015b). Our approach worked iteratively but systematically from the existing knowledge base of individual teachers to develop theories of action that disciplined and deepened the culture of teaching and learning of all teachers in the school and the Region. Critical to the success of the instructional rounds approach has been the development of 'theories of action'. A theory of action is a link between cause and effect: *if* we take a particular action, *then* we expect that action to have specific effects. A theory of action connects the actions of teachers with the consequences of their actions—the learning and achievement of their students.

As our experience with instructional rounds has continued to deepen in Wales (Caerphilly County Borough Council 2012), in Australia (Northern Metropolitan Region 2011) and in London and elsewhere, five important lessons have been learned. They are:

- The first was that despite the phase or context of schooling, the theories of action were in most cases very similar.
- Second, this is not a 'pick and mix' approach—all the theories of action have to be integrated into the teacher's professional repertoire if they are to impact in a sustained way on student learning.
- Third, and most importantly, all the theories of action are characterised by an approach to teaching that has enquiry at its centre.
- Fourth, some of the theories of action relate to the school and some to the practice of individual teachers.
- Fifth, all of the theories of action have a high level of empirical support in the educational research literature (Hattie 2009).

So to summarise, through the instructional rounds process an approach to teaching has been developed from the practice of teachers — across the Region — that if consistently applied will enhance not just the achievement, but also the spirit of enquiry and curiosity of all students. The four whole-school theories of action emerging from the instructional rounds process are as follows:

1. When schools and teachers set high expectations and develop authentic relationships, then students' confidence and commitment to education increases and the school's ethos and culture deepens.
2. When teacher directed instruction becomes more enquiry focused, then the level of student achievement and curiosity increases.

3. By consistently adopting protocols for teaching, student behaviour, engagement and learning are enhanced.
4. By consistently adopting protocols for learning, student capacity to learn, skill levels and confidence are enhanced.

The implications of these whole school theories of action are discussed in our other more recent work (Hopkins, Munro and Craig 2011, Hopkins 2013, Hopkins and Craig 2015a, b & c). Meanwhile, it is to the 'theories of action for teachers' that we now turn in the following section.

The Six Theories of Action for Teachers

Below are the six theories of action for teachers and teaching that emerged from our work with schools in Northern Melbourne and elsewhere. Together with the four whole school theories of action noted in the previous section, they comprise the content of the *Curiosity* booklet that we recently published (Hopkins and Craig, 2015b). This handbook that has a two page spread devoted to each theory of action: the left hand page containing a description of the individual theory of action, much as above; the right hand page showcases an educational artefact or tool that teachers can use to implement the theory of action in behavioural terms that increase their level of professional skill to a point that it impacts on the learning of their students.

Harnessing learning intentions, narrative and pace - *When teachers set learning intentions and use appropriate pace and have a clear and strong narrative about their teaching and curriculum, then students are more secure about their learning, and achievement and understanding is increased.*

It has become very clear from the instructional rounds that when teachers are clear about their learning intentions then the students become more engaged and feel more secure in their learning. But it is about more than just setting a learning intention or goal; importantly it is also about linking the intention to the learning outcome and success criteria for the lesson, as well as ensuring curricula progression. This becomes the basis for the narrative of the lesson. Teachers with a strong sense of narrative are able to engage with deviation, knowing how to bring the discussion back on track. Pace is also necessary to keep the lesson lively and through increasing tempo, deal with potential low-level disruption. A learning intention for a lesson or series of lessons is a statement that describes clearly what the teacher wants the student to know, understand and be able to do as a result of the learning and teaching activity. In formulating the learning intention it is essential to consider three components:

- An action word that identifies the performance to be demonstrated
- A learning statement that specifies what learning will be demonstrated
- A broad statement of the criterion or minimum standard for acceptable performance, e.g. 'By the end of the lesson you will be able to describe foundation concepts and questions in ...'

Setting challenging learning tasks - *When learning tasks are purposeful, clearly defined, differentiated and challenging then the more powerful, progressive and precise the learning for all students.*

In many of the instructional rounds conducted, we found that by and large, most students did not find the tasks they were set very challenging. Yet it is the tasks that students do that

predict their performance. This requires setting tasks that are within the student's 'zone of proximal development', if their learning is to progress. Usually, this involves having three or four 'graded tasks' available for each group with scaffolding around the task to ensure success. In *Looking in classrooms*, Good and Brophy (2008) identified the six components listed below as central to scaffolding support for pupils carrying out tasks:

1. Develop student interest in accomplishing the intended goal of the task.
2. Demonstrate an idealised version of the actions to be performed.
3. Simplify the task by reducing the steps.
4. Control frustration and risk.
5. Provide feedback that identifies the critical features of discrepancies between what has been produced and what is required.
6. Motivate and direct the student's activity to maintain continuous pursuit of the goal.

Closely associated with scaffolding is the gradual transfer of responsibility for managing learning. As students develop expertise they begin to assume responsibility for regulating their own learning, by asking questions and by working on increasingly complex tasks with a concomitant increase in learner autonomy.

Framing higher order questions *- When teachers systematically use higher order questioning, the level of student understanding is deepened and their achievement is increased.*

John Hattie reports in *Visible learning* (2009, p. 182) that questioning is the second most prevalent teaching method, after teacher talk. Most teachers spend between 35% and 50% of their time in questioning. Questioning has a positive impact on student learning—but this effect is associated more with higher order questioning which promotes more conceptual thinking and curiosity. The evidence suggests that most teachers ask low-level questions, related more to knowledge acquisition and comprehension. Research studies suggest that 60% of teachers' questions recall facts and 20% are procedural in nature. Bloom's taxonomy (Anderson & Krathwohl 2001) of learning objectives is widely used as a basis for structuring questions, particularly higher order questions. They are:

- **Knowledge**—recall previous material learned
- **Comprehension**—demonstrate understanding of facts and ideas
- **Application**—solve problems by applying knowledge, facts and skills learnt in different ways and situations
- **Analysis**—examine information and break into parts, make connections and support ideas and arguments
- **Evaluation**—present judgements, recommendations and opinions
- **Synthesis**—compile information in different, more creative ways; choose other solutions.

The following sequence works well, as this approach makes everyone responsible for generating an answer, particularly when combined with some of the simple cooperative techniques:

- Frame a question to the whole class
- Allow students time to think—'wait time'
- Only then, call on someone to respond.

Connecting feedback and data - *When teachers consistently use feedback and data on student actions and performance, then behaviour becomes more positive and progress accelerates.*

Feedback is one of the most powerful influences on student achievement. That is clear from both psychological theory and research. In *Visible learning*, John Hattie (2009, p. 173) provides a powerful insight, as he describes his attempts to understand feedback:

> *It was only when I discovered that feedback was most powerful when it is from the student to the teacher that I started to understand it better. When teachers seek, or are at least open to, feedback from students as to what students know, what they understand, where they make errors, when they have misconceptions, when they are not engaged—then teaching and learning can be synchronized and powerful. Feedback to teachers helps make learning visible.*

In considering data and feedback that moves beyond the purely academic, Hattie suggests that a behavioural focus on student performance helps students to recognise the linkage between effort and outcome. In addressing this behavioural dimension of student performance and achievement, it is recommended that the teacher should:

- Model beliefs
- Focus on mastery
- Portray skill development as incremental and domain specific
- Provide socialisation with feedback
- Portray effort as investment rather than risk.

Committing to assessment for learning - *When peer assessment and assessment for learning (AfL) are consistently utilised, student engagement, learning and achievement accelerates.*

The generally accepted definition of Assessment for Learning (AfL) is:

> '*The process of seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there'.* (Assessment Reform Group 2002).

This may be organised differently in different schools, but the rationale is always the same.

1. Clear evidence about how to drive up individual attainment.
2. Clear feedback for and from pupils, so there is clarity on what they need to improve and how best they can do so.
3. Clarity for students on what levels they are working at, with transparent criteria to enable peer coaching.
4. A clear link between student learning and lesson planning (Hopkins 2007).

Teachers need to continue to develop their understanding of how students learn so they can help them to: reflect on how they learn; develop learning strategies and apply them in different circumstances; and engage in high quality dialogue with teachers, peers and others.

Implementing cooperative group structures - *If teachers use cooperative group structures/techniques to mediate between whole class instruction and students carrying out tasks, then the academic performance of the whole class will increase as well as the spirit of collaboration and mutual responsibility.*

Cooperative group work has a powerful effect in raising pupil achievement because it combines the dynamics of democratic processes with the discipline of academic enquiry. It encourages active participation in learning and collaborative behaviour by developing social as well as academic skills. The approach is highly flexible and draws on a wide range of methods—individual research, collaborative enquiry and plenary activities—and allows the integration of them all into a powerful teaching tool. It is most commonly used as part of the direct instruction model, both as part of teacher instruction and the structuring of group activities, although at times the teacher will use the approach to structure a whole lesson or series of lessons.

There are a wide range of strategies that comprise cooperative group work. They are all underpinned by the following five principles (Johnson & Johnson 1994):

1. Positive interdependence: When all members of a group feel connected to each other in the accomplishment of a common goal—all individuals must succeed for the group to succeed.
2. Individual accountability: Where every member of the group is held responsible for demonstrating the accomplishment of their learning.
3. Face-to-face interaction: When group members are close in proximity to each other and enter into a dialogue with each other in ways that promote continued progress.
4. Social skills: Human interaction skills that enable groups to function effectively (e.g. taking turns, encouraging, listening, clarifying, checking, understanding, probing). Such skills enhance communication, trust, leadership, decision-making and conflict management.
5. Processing: When group members assess their collaborative efforts and target improvements.

Cooperative group work requires pupils to practise and refine their negotiating, organising and communication skills, define issues and problems and develop ways of solving them. This includes, collecting and interpreting evidence, hypothesising, testing and re-evaluating.

The curiosity booklet - As teachers and principals quickly embraced the Theories of Action it became apparent that, while the "different" style and language of the *Curiosity* booklet was highly engaging, it was the strong research base that stood behind the various theories that made the propositions so compelling. Our colleague John Hattie generously encouraged us to use his work to illustrate the likely effect size associated with each of the theories of action (Hattie 2009). This served to deepen the view among principals and teachers that although significant progress had already been made, the possibilities were boundless if the Theories of Action were applied with precision.

One particular insight was critical here. It was clear from the specifications of practice and research evidence presented in the *Curiosity* booklet that each of the Theories of Action if implemented with precision would have a significant and sustained impact on student achievement. Over time this was accepted without equivocation. What however was also becoming apparent was that when applied together, as a shift in the culture of teaching and learning in a school, was that in concert the Theories of Action would also have a profound impact on the incubation and development of curiosity within our students. The Theories of Action have both a meta-cognitive as well as achievement effect. Thus the twin goals of developing learning skills and raising student achievement could be met at the same time, using the same processes.

The almost fervent adoption of the *Curiosity* booklet was reinforced by our emerging understanding of neuroscience that was being disseminated across the region at the same time. Work from a range of cognitive scientists including Daniel Willingham, *Why Don't Students Like School* (2009), John Medina, *Brain Rules* (2008), Mariale Hardiman, *The Brain Targeted Teaching Model for 21st Century Schools,* (2012) and Eric Jensen's (2005), *Teaching with the Brain in Mind* further encouraged practitioners. For example, Willingham's (2009) notion that, "*People are naturally curious but we are not naturally good thinkers; unless the cognitive conditions are right, we will avoid thinking",* served to emphasise the importance of a whole school focus on inquiry. "*People are naturally curious, but curiosity is fragile",* reinforced the need to not only set challenging tasks but also set tasks that are just right – that is, tasks that are neither too easy nor too hard but right in the zone of proximal development (Willingham, 2009).

We have been both surprised as well as gratified by the enthusiasm that the *Curiosity* booklet has generated among teachers and Principals. Although we say it ourselves, in a short time it has assumed an iconic status representing as it does the teachers commitment to their own professional learning and the Principals' engagement with school improvement and student learning.

Coda - Theories of Action for School and System Reform

One of the happy consequences of our work in Melbourne and the State of Victoria is the development of an action framework for school improvement, that moves us from what we know, by addressing the barriers that prevent us realising that potential, to theories of action that give more precision to the achievement of our moral purpose. The overarching or meta-theory of action, that relates to our overall model of school improvement described at the outset, is something like this:

> *When all the distinct but interrelated parts of what we know about school and system improvement are aligned and working together, then all students, schools (as well as the system as a whole) will realise their individual and collective potential.*

The work described in this paper has given us the opportunity to develop the following set of more specific theories of action related to individual aspects of the overall comprehensive process (Hopkins 2013):

1. When schools and systems are driven by moral purpose then all students are more likely to fulfil their potential
2. When the focus of policy is on the quality of teaching rather than structural change, then student achievement will increase
3. When schools and teachers are of high quality, poverty is no longer such a determinant of educational success
4. When the focus is on powerful learning, then students will both attain more and develop their cognitive and social skills
5. When teachers acquire a richer repertoire of pedagogic practice then students' learning will deepen.
6. When data is used to monitor, feedback and enhance student performance, then students' progress will more quickly accelerate

7. When teachers and schools go deeper in their search for improvement (rather than adopting fads) then the student learning experience also deepens and outcomes improve
8. When leadership is instructionally focused and widely distributed, then both teachers and students are able to fully capitalise on their capacity to learn and achieve
9. When teachers and leaders employ more precise strategies for teaching, learning and improvement, the whole system benefits
10. When the system as a whole takes student learning seriously then moral purpose is achieved

The purpose of this case study of school and system improvement in Melbourne, Victoria is to illustrate how we have attempted to realise this theory of action in practice.

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